

Outlines

Studies aimed to verify the final set of cuts and PV acc./rej. measuring procedures are done. This may be used as a reference point in developing cuts and procedures for pnn2 analysis.

- The procedure of getting the final set of cuts used for the box opening is verified, identical results were obtained.
- PV rejection with 2/3 pnn1 data was remeasured. Close, but not identical results were obtained. The reason was not completely understood and might be because of the difference in samples used for the procedures.
- PV acceptance with 2/3 with km21 (newly produced for pnn2) was remeasured. The results are close. A flaw seems to be found in the way correction is applied with blankout method. When the new correction is applied the results of layer 18 method and blankout method are almost the same and both are higher than in TN K-034.

Final cut set

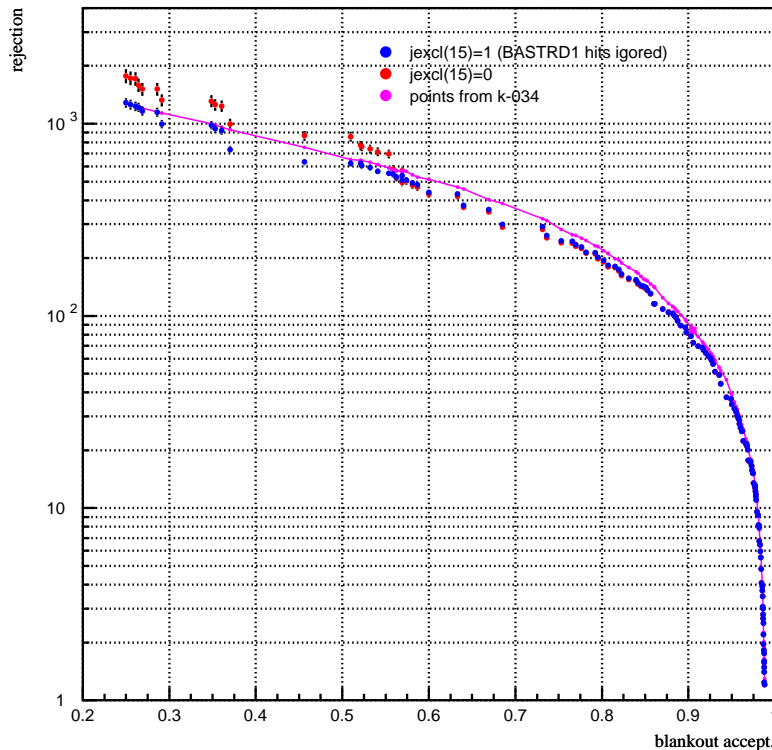
- The final cut set was verified by means of reproducing the so called “small ntuple” which was used for making pictures for TN K-038 and articles and can be found in Shaomin’s area. This ntuple contains only events in the box (big one) and without any cuts on (p,E,R).
- The original code by Shaomin doesn’t reproduce the ntuple exactly because of the PV parameters file located in the general area was changed later. Another difference between Shaomin’s and general area codes was found. These differences are understood, recommendations on how to construct the final cut set is distributed to e-mail list of the current developers.
- Not obvious finding: don’t use year 2003 version of paw (at least one which is at TRIUMF’s rarek machines), year 2001 paw executable reproduce the results exactly, year 2002 one seems to do it to the machine precision accuracy.

PV rejection remeasurement

The approach:

- The sample was 2/3 pnn1, supposedly the same as was used for the previous measurement. Setup cuts were constructed as described in TN K-034. Basically they select Kp2 events from the peak.
- PV of different levels of tightness was applied and suppression factor (rejection) was measured. For the next slide picture the acceptance at each level of PV tightness is assumed to be the same as measured with 2/3 in pnn1 analysis (from K-034).

PV rejection remeasurement (cont.)



- The better agreement is achieved if BASTRD1 category is not used. BASTRD1 stands for “Both ADC and Single ended TDC in RS”. This seemed to be how the curve in TN was measured. Although the remeasured curve shows the lower rejection.
- The difference might come because of, apart from what’s written in the TN, the other setup cuts were used. The code with the setup cuts seems to be lost, but there is a sample selected with them. Running my script with this sample is in my wish list.

- In the course of these studies it was also found that applying final TD cuts, skim level TD cuts or not applying TD cuts at all almost does not affect the curve.

PV acceptance remeasurement

The approach:

- The sample was 2/3 km21 from recent (June 2005) production runs (no old km21 data on disks at the moment). Setup cuts were constructed as described in TN K-034. Basically they select muons from events from the peak in (p,E) with $R > 37$ cm.
- Additional setup cut `layv4.le.18` was applied so that muons had to stop before the layer 19. PV of different levels of tightness was applied and passing fraction of events (acceptance) was measured. This is referred to as **the layer 18 (L18) method**. Online, offline and the total acceptance can be measured this way.
- Penetrating muons are used as well. To measure the acceptance hits in $[-8,+4]$ sector range of the stopping sector (quarter of total sector number) in BV, BL are ignored. The measured apparent acceptance needs to be corrected (reduced) to account for vetoing power of the ignored (blanked) part of BV, BL. This is referred to as **the blankout method** and this was how the total acceptance was measured previously.
- In K-034 the online acceptance was measured with the L18 method and the total acceptance was measured with the blankout method. Remeasuring is done with the L18 method for online acceptance and with both methods for the total acceptance.

PV acceptance remeasurement

Online acceptance

	Remeasurement	K-034
HEX	0.935 ± 0.001	$14168/15183=0.933 \pm 0.002$
HEXafter ^a	0.965 ± 0.001	$13869/14168=0.979 \pm 0.001$
EC	0.989 ± 0.001	$13711/13869=0.987 \pm 0.001$
BV	0.988 ± 0.001	$13562/13711=0.989 \pm 0.001$
BL	0.981 ± 0.001	$13308/13562=0.978 \pm 0.001$
(L20ct+L21ct)	0.993 ± 0.001	$(13220/13308=0.993 \pm 0.001)$
Online TOTAL	0.859	0.871 ± 0.003

^aKetnaro is known to use software simulation of HEX afterburner while here a trigger bit is used.

PV acceptance remeasurement

The blackout correction

- Notations: a is an apparent acceptance (“as is” measurement with a quarter of BV, BL blanked), $a_1 = 1 - f_1$ are acceptance a_1 and failure fraction f_1 measured with BV, BL only, A is the corrected (true) acceptance.
- Here is how it is used to be done:

$$A = a - 1/3 \cdot f_1$$

This assumes that if another quarter BV, BL is unblanked the failure fraction would rise by 1/3. **This is only an approximation for low failure rates.**

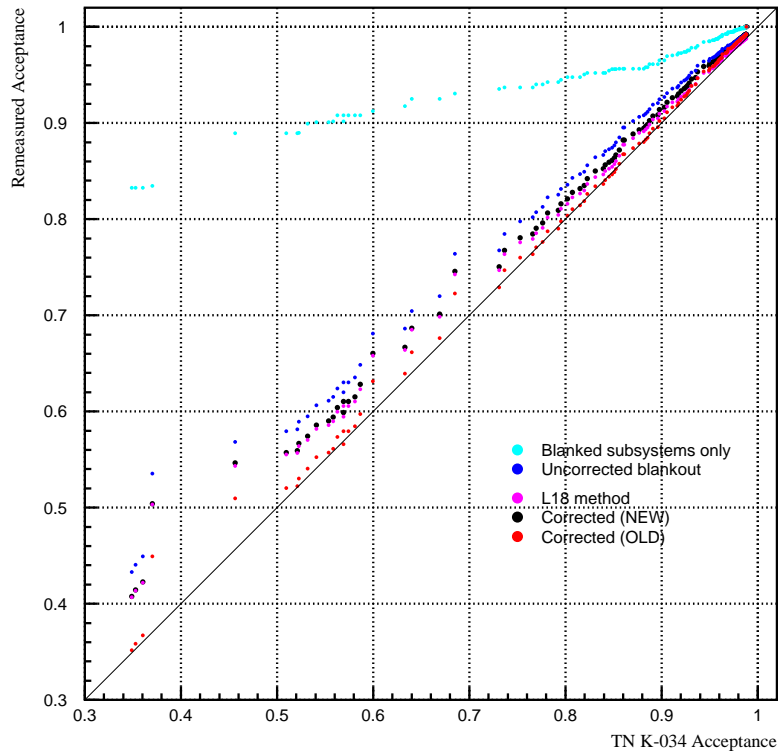
- Here is how this should be done:

$$A = a \cdot a_1^{1/3}$$

This assumes that unblanking another quarter of BV, BL would be equivalent to introducing a new device with the acceptance of $a_1^{1/3}$.

PV acceptance remeasurement

The horizontal axis is K-034 measurement at different PV tightness, the vertical axis the corresponding remeasured values. Sets of points are described in the color legend.



- Applying the old style correction closely reproduces K-034 results (**red points**).
- The L18 method (**magenta**) is in a good ($< 1\%$) agreement with blankout method (black) if the new style correction is applied. Both shows noticeably higher acceptance at tight PV cuts than K-034 measurements.

Summary

- The final set of cuts used in pnn1 analysis is verified
- The built procedure of measuring PV rejection seems to produce reasonable results
- The built procedure of measuring PV acceptance seems to produce reasonable results
- A better understanding can be achieved with acc./rej. stuff OR one can proceed with measuring rej. and acc. in application to pnn2 analysis

Left to do

- Document everything (in progress)
- Produce full rej. vs acc curve
- Understand the difference in rejection measurements (old sample still exist)
- Understand the difference in acceptance measurements (old sample might exist)

Implementation

- Rej. vs acc. curves with kink samples